# Chapter 2
# Alternatives

## 2.1 No Action Alternative

The "no action" alternative for this PEA is for Reclamation to contribute minimal assistance toward habitat improvement activities within these three subbasins. There might be Reclamation funding of planning efforts; however, these funds would be minimal and could not be used for on-the-ground project work (construction). Reclamation's Demonstration Project has been completed, and Reclamation does not have funding or authority to continue the Demonstration Project. The "no action" alternative acknowledges that improvements will still get accomplished in the subbasins, but with limited Reclamation funds and technical expertise.

As described in Section 1.6 above, there has been much passage improvement, fish screen installation and, to a lesser degree, streamflow augmentation effort in the three subject subbasins over the last 10 or more years. It is anticipated that this work will continue into the foreseeable future. However, the current level of Reclamation funding for existing programs is inadequate to complete the screening and barrier tasks within the 10-year time frames as identified in the BiOp from NMFS (USBR 2001). It is presumed that Reclamation funding is inadequate to fully resolve low streamflow issues as well.

The implementation of Action 149, as identified in the NMFS December, 2000 BiOp, is a legal requirement under the ESA. The BiOp finds that operation of the FCRPS constitutes "jeopardy" to anadromous fish species. Therefore, the action agencies, including Reclamation, the U.S. Army Corps of Engineers (COE) and BPA, must implement these Action 149 off-site mitigation measures to offset the effects of the hydropower system, or potentially face legal actions as a result of a jeopardy opinion. The "no action" alternative is not a viable alternative but, in compliance with NEPA, must be evaluated and its impacts compared to those of the action alternative.

## 2.2 Proposed Action

The proposed action is the implementation of Reclamation's responsibilities under Action 149 of the 2000 FCRPS BiOp in the North Fork John Day, Middle Fork John Day, and Upper John Day subbasins in order to conserve listed species under the ESA. Toward this end, Reclamation will provide technical expertise, and construct or provide construction funding, to accelerate improvements in fish habitat. These actions will occur through December 2010 in the Upper John Day and Middle Fork John Day subbasins; and through December 2012 in the North Fork John Day Subbasin. This effort and funding will be directed to improve fish habitat, which in turn should improve fish populations, by using established, accepted methods for removing fish passage barriers, augmenting streamflows, and providing or updating fish screens. All activities will abide by applicable permit requirements and state water law.

The following is a list of potential measures that Reclamation expects to contribute to or implement. Depending on the subbasin-specific conditions, not all measures will apply to all subbasins. Discretion will be used in determining which measures are appropriate in meeting the particular passage, flow, and screen deficiencies for each situation.

| <u>**Goals**</u> | <u>**Potential Measures**</u> |
|---|---|
| Correct passage barriers | Remove pushup dams and replace with pump systems, infiltration galleries, or other permanent type structures, such as LFSDs, with viable fish passage facilities.<br>Consolidate diversions. |
| Correct streamflow deficiencies | Acquire water for in-stream flow during critical migration periods.<br>Replace headgates to provide better control of water withdrawals, and install measuring devices. |
| Correct screen deficiencies | Utilize rotary drum, flat plate, or traveling belt screens that meet NMFS criteria.<br>Utilize NMFS-approved exposed or buried well screens on pump intakes.<br>Utilize screen methods to protect fish from wasteway attraction flows.<br>Utilize siphons at stream/irrigation ditch interfaces. |

Because the specific choice of locations and the number of willing participants is not known, nor can the choice of specific measures be determined at this time, this Environmental Assessment is prepared at a programmatic level.

The following descriptions of these methods are general and for broad application. Individual project sites will be evaluated with the landowner to select appropriate treatments and to customize designs as necessary to account for site-specific features such as flow range and topography.

### *2.2.1 Management Constraints*

In developing the suite of strategies to implement Action 149, the following management constraints were applied:

a. Reclamation will address issues/needs which have been caused by water diversion activities.

b. Reclamation will address barrier removal and screening issues/needs which are in non-public ownership (as opposed to U.S. Forest Service and other public ownership). Both the facility and land must be non-public.
c. All work accomplished in pursuit of Action Item 149 of the 2000 BiOp will be done with willing participants.
d. Reclamation activities will be confined to in-stream work, with the exception of some screening activities.
e. Reclamation will assume no operation, replacement or maintenance responsibilities associated with construction or other programs developed as a result of this effort.
f. Fish screens and fishways (fish ladders around dams) will be designed to meet the applicable NMFS and USFWS criteria. (NMFS fish screen criteria are included in Appendices C and D. USFWS defers to NMFS for fish screen criteria, even for bull trout. Fishway criteria are detailed in Table 4.)
g. Screens developed through this effort will be sized to meet existing water rights.
h. Flow issues will be addressed in accordance with state water laws.
i. Water acquisition will occur through water purchases or interim leases. Water purchases will be negotiated in a manner such that water rights ownership is in the name of a legally-recognized third party, not in the name of the U.S. Government.
j. Reclamation's presence and assistance in each subbasin is anticipated to be limited to 10 years.

### *2.2.2 Passage Barriers*

The purpose of pushup dams is to raise the water level such that irrigation headworks can draw the allotted volume of water. Unintentionally, the dams frequently become obstacles to migrating fish, especially as flow recedes during summer and fall and most flow passes through the rock dams rather than over them. In these cases, the dams can function like a sieve and inhibit upstream and downstream movement of adult and juvenile fish. Note that for purposes of this PEA, passage barriers are defined as water diversion structures such as pushup dams. Passage barriers as defined herein do not include log jams, mining tailings, stream configurations, or thermal barriers.

The primary means of correcting these passage obstacles is by replacing pushup dams with alternate means of acquiring water for the irrigation system. There are four currently-accepted technologies that can eliminate the need for most pushup dams as described in the following four sections.

Another barrier to fish passage sometimes occurs when an irrigation ditch intersects a stream. These ditches can capture and divert the streams themselves. Siphons can be used to remove this type of fish passage barrier by sending the irrigation water through a pipe under the stream. Screens can also be used to keep fish in the stream and out of the ditch, though they are less effective than siphons in this application. Both screens and siphons are discussed in section 2.2.4, "Fish Screens."

For all passage barrier removal actions, in-stream activities must be performed within the ODFW guidelines for timing of in-water work, and coordinated with the District Fish Biologist for emergency extensions of the work window, which is:

- July 15 to August 15 in the Upper John Day (main stem) upstream from John Day, and the Middle Fork and North Fork John Day upstream from the Highway 395 crossings,
- July 15 to August 31 in the remainder of the reaches downstream from John Day and Highway 395, or
- An alternate work window that may be required by ODFW or NMFS.

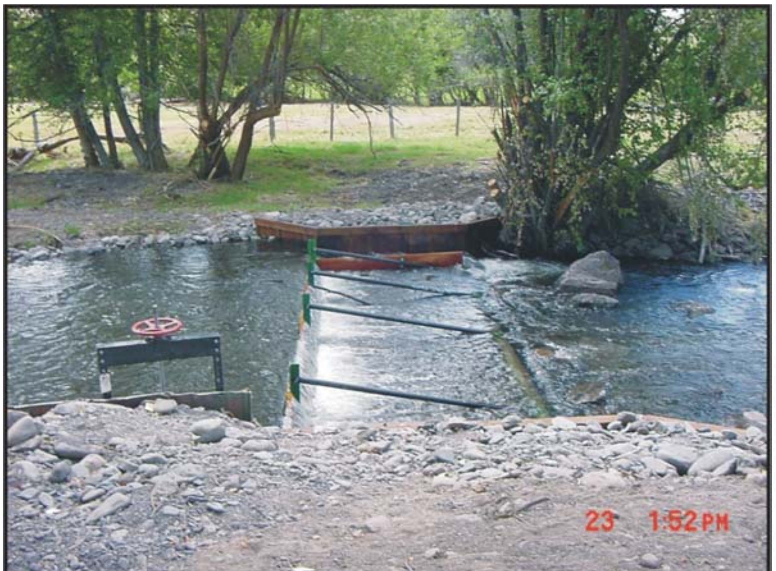


*Figure 4. Lay-flat stanchion dam (2001 Coolie Island diversion project).*

*Figure 5. Lay-flat stanchion dam showing fishway (2001 Coolie Island diversion project).*

*2.2.2.1 <u>Lay-flat stanchion dams</u>*

Pushup dams can be replaced with stanchion dams, such as LFSDs, which are permanent structures built in the channel (Figures 4 and 5). LFSDs are constructed of pre-cast concrete sections buried in the streambed with tops set at streambed grade. Weld plates are fixed to the concrete to allow the addition of stanchions and braces to hold flashboards for ponding water during the irrigation season. When flashboards are in place, one section of the dam is set at a lower level to concentrate flow and create a fishway for upstream and downstream passage of fish within the river channel at all flows. Often, steel sheet piling is installed to protect adjacent streambanks from erosion. Sheet piling may not always be available, or equipment may not be able to access a work area, so alternative materials such as concrete might be used. See Appendix E for a generic LFSD design.

Outside of the irrigation season, the flashboards, braces, and stanchions are removed so that high flows, debris, and bedload pass unimpeded and do not damage the structure or adjacent streambanks. Examples of LFSDs in the John Day Basin include the Holliday Ranch and Keerins diversions (USBR 2000), Coolie Island diversion project (see Figures 4 and 5), and Beaver Dam diversion project.

Construction of LFSDs requires one-time excavation within the river channel and adjacent riparian areas. A typical installation takes from two to five days, with about half of the time involving in-stream work. During in-stream work, streamflow is diverted around the local construction site so that virtually all work is completed in dry or semi-dry conditions. First, pre-cast concrete blocks are placed into the streambed, then sheetpiling is driven into the streambed along the banks. The culvert and headgate are installed in the sheetpiling along one bank. Clean rock and native soil are used to backfill the sheetpiling, fill a portion of the old ditch, and bury the new culvert section. Finally, the pushup dam is removed or re-graded and the bank and spoils are shaped to natural grades and revegetated as necessary.

It may be necessary to replace the headgate at the same time the LSFD is installed. The headgate and culvert are installed through the streambank-protective sheet piling (on the side opposite the fishway) to control the diversion of water into the ditch. Headgates will be sized to the appropriate delivery rate in accordance with Oregon water laws. Water measurement devices will be appurtenant features of headgate installations as necessary.

An automated headgate may be installed as an appurtenant feature to the LFSD and headgate design. An automated headgate allows a constant, targeted flow of water in the delivery ditch, regardless of the flow in the stream channel from where the water is diverted. See Section 2.2.3.2 for a more detailed discussion of automated headgates.

The fishway and other features of LFSDs will be appropriately designed in accordance with applicable NMFS and USFWS fish passage criteria for all life stages. Currently, USFWS does not have guidelines for upstream passage of bull trout, but is in the process of developing them (Chris Allen, USFWS, personal communication, September 2002). NMFS currently has no published criteria for upstream passage of adult and juvenile salmonids that would apply to diversion structures in the John Day subbasins. (NMFS has upstream passage criteria in internal review, but those criteria are unlikely to become formally adopted in 2002.) However, NMFS does provide the following guidelines (Table 4) for upstream salmonid passage as currently applied to small diversion dams (Larry Swenson, NMFS, personal communication, May 2002).

Table 4. NMFS Guidelines for Upstream Salmonid Passage at Small Diversion Dams.

| Salmonid Size Class | Maximum Drop Between Pools | Maximum Water Velocity (at bottom of falls) |
|---|---|---|
| Adults | 12 inches | 8 feet per second |
| Juveniles | 6 inches | 5 feet per second |

In addition, pools must be sufficiently sized and configured to provide resting areas, and deep enough so that energy is dissipated and fish can effectively leap or swim from pool to pool. Fishway exits should be sufficiently separated from diversion intakes and configured to minimize “fallback” of fish. Natural substrate (e.g. cobbles and boulders) is generally considered desirable in fishways to produce natural hydraulics.
LFSDs are most appropriate where:

- river banks are sufficiently high and stable to allow construction of the dam, headgate works, and diversion pool,
- the channel is narrow enough to make LFSDs construction cost-effective,
- stream substrate is heavily silted or otherwise inappropriate for an infiltration gallery (infiltration gallery screens are susceptible to clogging by silt and clay),
- the point of application is relatively close to the point of diversion (so as to minimize losses from the water delivery system), and
- sufficient head differential exists between diversion and use to allow a gravity system.

*2.2.2.2 <u>Infiltration galleries</u>*

In some cases, pushup dams can be replaced with infiltration galleries, which are long sections of well screen buried approximately one foot under the river channel (Figures 6, 7, and 8). Well screens draw water from within the substrate, and transmit it by gravity into the irrigation system. Because there is no dam, there is no obstacle to fish passage. Well screens cover a large area and are of fine-mesh (openings <3/32 inch), thus no fish can be drawn into them, and are designed for intake velocities of less than 0.4 feet per second. An access pipe and irrigation shut-off valve allow air to be injected backward into the well screen to clean sediment and debris from it periodically. Examples in the project area include the Fields, Lemon, Courchesne, and Rudishauser galleries (USBR 2000). See Appendix F for a generic infiltration gallery design.

*Figure 6. Infiltration gallery showing well screen installation (1998 Fields demonstration project for USBR).*

Construction of an infiltration gallery requires one-time, shallow excavation and screen/pipe burial in the channel and adjacent riparian areas. During construction, streamflows are directed around the work area using temporary barriers where possible, or temporary piping on small sites. A trench is excavated two feet wide by 16 inches deep (for a 12-inch screen) to receive the screen and pipe. The collector is placed in the trench and connected to the control station and delivery system. The control station consists of the control valve and backflush plumbing. Excavated materials are used to cover the collector. Excess spoils are shaped over the disturbed area of the streambank and seeded, usually later in the fall.

*Figure 7. Cover over infiltration gallery (1998 Fields demonstration project for USBR).*

If the collector supplies an open ditch delivery system, a flow measuring device may be installed as an appurtenant feature so the system can be regulated to the legal rate of diversion. If the system supplies a pump, the pump outlet is equipped with a totalizing flow meter.

Screens are stainless steel and sized from two to 36 inches in diameter, with intake slot openings sized from 0.010 to 0.100 inches. The length of screen for a particular site depends on the substrate material; finer material requires longer lengths of screen for a given amount of intake. Collectors are placed shallow, with the crown of the screen approximately four inches below the existing streambed elevation (screens buried deeper tend to seal over and require more frequent back flushing).

Infiltration galleries are most appropriate where:

- stream substrate is composed of coarse gravel and cobble, with little silt and few organic matter fines, to avoid clogging of the buried screen,
- streambanks are stable, so the well screen collector is less likely to be exposed by streambank failure and resulting headcut migration,
- the least intrusive structure on site is important,
- point of application is relatively close to the point of diversion (so as to minimize losses from the water delivery system),
- sufficient head differential exists between diversion and use to allow a gravity system, and
- flows can be easily re-routed around the site during construction.

*Figure 8. Infiltration gallery upon completion (1998 Fields demonstration project for USBR).*

#### 2.2.2.3 Permanent pump stations

Permanent pump stations (Figures 9 and 10) can be associated with a natural pool or a buried well screen to eliminate the need for a pushup dam. Because they do not rely on gravity flow, pumps can be located closer to the irrigated fields (rather than substantially upstream from the fields, as most ditch diversions are), thus reducing the length of river from which water is removed, and the length of ditch or pipeline required to deliver the water. Water loss to evaporation and ditch seepage is generally lower with pump stations relative to the longer ditches associated with pushup dams. Pump intakes are screened relative to the maximum flow capacity to meet NMFS criteria (Appendix C) and ensure fish are not injured, thus eliminating the need for separate screens within the irrigation system. Examples in the project area include the Cathedral Rock, Clausen, Kight, Ediger, Page, Morris-Pike, and Lee irrigation projects (USBR 2000). See Appendix G for a generic pump station design.

*Figure 9. Pump at permanent pump station (1994 Cathedral Rock ditches project for USBR).*

A pump station consists of a screened intake pipe in the river connected to a pump mounted on the bank. The pump is connected to the rest of the irrigation delivery system (usually a pipeline) and a reliable source of power (to power the pump motor). Power sources may include electricity or diesel. Virtually all construction is done only once, off-site, and on the bank outside of the stream channel.

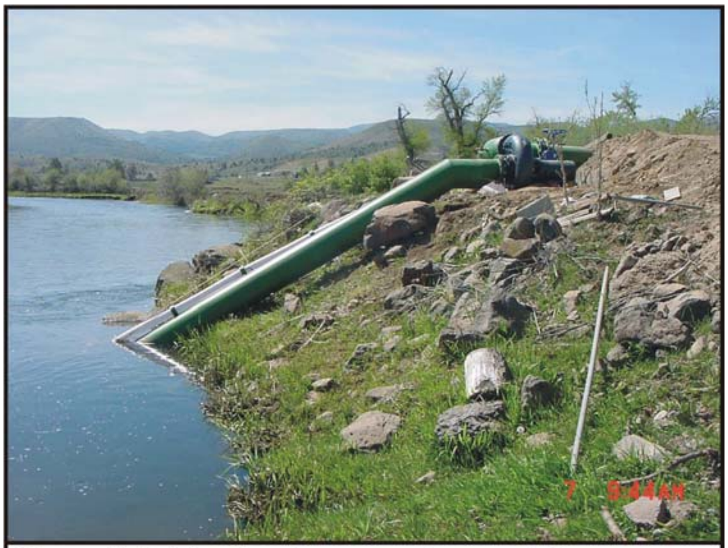

*Figure 10. Intake pipe at permanent pump station.*

A flow meter should be installed as an appurtenant feature on permanent pump stations. Most flow meters are mechanical and show the rate at which water is withdrawn and have a totalizing feature to record use of water over time. The rate of withdrawal should be recorded in gallons per minute or cfs. The totalizer should record in acre-feet (af).

Pump stations are most appropriate where:

- power lines can be run to the site (if electricity is used to power the pump motor), or diesel fuel can be stored (if diesel is the power source),
- the stream/river is too large for LFSDs to be practical or safe to install,
- topography does not allow gravity flow into the irrigation system,
- stream bottoms are heavy to silt or clay, thus precluding the use of infiltration galleries,
- high water volumes (in excess of 2.0 cfs) to serve large acreages (80 acres or more) are required,
- point of application is far from the point of diversion, thus precluding the use of LFSDs and infiltration galleries with their associated delivery system losses through evaporation and leaks, and/or
- flows cannot be easily re-routed around the construction of infiltration galleries or LFSDs.

Installation of a pump station may involve some disturbance to the channel and the adjacent riparian area to remove the pushup dam and set the pump. Further disturbance may be required to maintain an adequate pool level in the stream for the pump intake and to provide electrical service to the pump site.

Note that for the purposes of this PEA, a permanent pump station is a potential action item under Reclamation's ESA Habitat Program if the pump station replaces an in-stream structure (such as a pushup dam) and is an optional way of handling a diversion screen or barrier issue. If not, then the pump station would not fall within the scope of this PEA and would not qualify under Reclamation's ESA Habitat Program.

*2.2.2.4 Consolidate diversions*

In some cases, two or more diversions might be consolidated into one system to eliminate the need for one or more pushup dams. In this scenario, a downstream diversion system is fed water by an upstream diversion. The connection can be made via pipeline or ditch. This option is very limited to situations where topography, ownership, and water rights allow such transfers. Examples in the project area include Widows Creek and the Holmes Pipeline (USBR 2000). Figure 11 of the Holmes Pipeline project shows the installation of an eight-inch PVC under the Middle Fork John Day River to feed water to a lower ditch delivery system from a single upstream

*Figure 11. Water delivery pipe feeding lower ditch delivery system from upstream diversion (Holmes pipeline project for USBR).*

diversion. The single diversion now delivers the irrigation water previously provided by two diversions.

Combining diversions into one system would require a Transfer Application for a Change in Point of Diversion to be filed with the OWRD for the downstream ditch diversions to be moved to the common diversion point. If the point of diversion moves more than ¼ mile or crosses another point of diversion, advertising the proposed change is required. The “Transfer Application” process may take six months to a year to complete.

If an upstream change in point of diversion is requested on a stream where an in-stream water right appurtenant to a reach of the stream is in force, the upstream transfer may be considered an injury to the in-stream water right. An upstream move of a point of diversion would partially “de-water” the stream by the amount of the appropriation and would be considered an injury to the in-stream water right within the reach that is receiving less water after the transfer. However, combining the ditches and eliminating one or more diversion dams would be a benefit to the stream.

Consolidation of diversions requires one-time excavation within the river channel to remove the pushup dam and along the route of connection between irrigation systems. Diversion consolidation is often included in projects to replace two or more pushup dams with a permanent diversion facility such as a LFSD or infiltration gallery.

### *2.2.3 Streamflow*

#### *2.2.3.1 <u>Acquisition of water for in-stream flow during critical migration periods</u>*
The most expedient method of increasing streamflow is to transfer existing consumptive water rights to in-stream water rights of record. OWRD becomes the custodian of all water transferred to in-stream.

Oregon water law allows the landowner to change the use of an existing certificate of water right to in-stream use through the transfer or lease process. For example, if a water right for irrigation were transferred to in-stream use, the amount of water allowed on the certificate would remain in-stream from the point of diversion of record downstream in an established reach for in-stream use with the same priority as the original right of record. The resulting in-stream water right could call (have junior rights in priority regulated in favor of the older in-stream priority) for water from junior water rights upstream. Junior water rights of record downstream within the designated reach of the in-stream water right would not be allowed to appropriate the water.

A transfer from a consumptive use to an in-stream use may result in the elimination of the original water right of record’s diversion. If the water right is permanently transferred in its entirety, there might not be a need for a diversion dam or pump at the original point of diversion. However, in some cases only a portion of the water right may be transferred, or the transfer may be temporary, resulting in the need to maintain the diversion.

Transferring or leasing a certificate of water right to an in-stream water right may be made if there is no injury to an existing right of record or enlargement of the original right of record. Such shifts in water rights must follow established OWRD procedures, which include notifying interested stakeholders so that they may assess potential impacts. When a right is leased or transferred to in-stream use, the OWRD determines:

1. The amount of water actually used under the original right of record, after accounting for losses to the stream. For example, an irrigator may divert 1.0 cfs in a ditch. However, losses returning to the stream may be 30 percent of the flow diverted. The in-stream water right quantity allowed would be 0.70 cfs.

2. The reach of the stream/river that could be served by the in-stream water right. The in-stream flow will be protected within this reach by OWRD staff.

3. Period of use of the in-stream water right. If the full rate of a water right (daily usage allowed under the water right) is used continuously for approximately 100 days, the duty (annual total water usage allowed under the water right) is reached. If the water right has a season of use (e.g., irrigation), the full rate will not cover continuous use of the right for the full season allowed. When a right of record that has a seasonal use associated with it is transferred or leased to in-stream, the OWRD determines when the period of in-stream use is to occur.

It is important to note that an irrigation water right is lost if it is not used at least once during the irrigation season within a five-year period.

There are five ways an existing right of record can be used as an in-stream water right:

1. Transfer: A certificate of water right holder may permanently transfer the water allowed under their right of record to in-stream use (OAR 690-077-0075). This would create a permanent in-stream water right. The water right could be acquired either through purchase or as a gift. This is the preferred method of increasing streamflows because it provides a specific amount of flow in perpetuity. An additional benefit is that the transfer to in-stream may result in the removal of a diversion dam or fish screen, or both. (Note: OAR is an acronym for "Oregon Administrative Rules," a compilation of the administrative rules of Oregon state agencies, compiled, indexed, and published by the Secretary of State's Office.)

2. Lease: A certificate of water right holder may lease the water allowed under their right of record to in-stream use (OAR 690-077-0077). The owner of the water right may lease out the water for in-stream use for a period of one to five years at a time. Further leases in one- to five-year increments are possible after the expiration of the previous lease.

3. Split Season Use: A certificate of water right holder may split off a portion of the water allowed under their right of record and lease it out for in-stream use (OAR

690-077-0079). A landowner would irrigate up to a certain date (July 1 and July 15 are likely dates), then the balance of their annual water right would remain in-stream as a legally protected in-stream right for the rest of the season. For example, a split season lease may be applied for when a user has five af of duty but uses only three af of the duty and desires to lease the remaining two af for in-stream use.

Under state water law, adequate measuring devices are required to guarantee that the water right of record is not being expanded. As with leases discussed above, the duration of the split season use is limited to five years or fewer. Further leases in one- to five-year increments are possible after the expiration of the previous lease. Split season leases were authorized during the 2001 Oregon legislative session.

4. Cancellation: Cancellation of a water right will allow the water to remain within the stream channel. However, the water is treated as all other natural flows and may be appropriated by any legal water right holder. Any new water right subsequently applied for will be treated as a new application and assigned a current date.

5. Payment for non-use: One could pay an irrigator not to use water seasonally to increase flows during critical times for fisheries resources. For example, an irrigator could be paid to grow one less crop of alfalfa a year, thus freeing up the water normally used for that last cutting. However, as with cancellation of water rights, the water not used may be appropriated by any other legal water right holder on that stream. The payment agreement between the irrigator and water purchaser would be in the form of a contract. Annual contracts are recommended. However, if multi-year contracts are used, all parties need to be aware of the five-year “no-use” clause: an irrigation water right is lost if it is not used at least once during the irrigation season within a five-year period.

The “transfer” process is the preferred method of acquiring water for in-stream use because it provides sustainable water for the future. The lease and split season lease options have potential benefits, too. However, the benefits are short term because the water leased will return to the original use after the lease term has expired.

Cancellation of water rights or payment for non-use are so limited in their application, because of the potential for appropriation by others, that they are not deemed viable methods of increasing streamflows in the main river reaches. However, these approaches can provide some localized benefit in tributaries to the main river reaches.

To the extent possible, streamflow acquisitions will comply with NMFS protocols (currently NMFS 2001) for improving the protection of listed steelhead.

### 2.2.3.2 *Replacement of headgates to provide better control of water withdrawals and install measuring devices*

Non-functioning headgates and measurement devices can inadvertently allow excessive water withdrawals, including withdrawals that exceed the limits of the water right of record. One way to control withdrawals is to install approved headgates and appurtenant measuring devices which measure the rate at which water is being diverted. A functioning and properly-controlled headgate, along with a measuring device, would allow the water user to divert the appropriate amount of water to fulfill the needs of the water right without waste.

The Natural Resources Conservation Service has several headgate designs to assist the local water user. Headgates will be sized to the appropriate delivery rate in accordance with Oregon water law. Immediately downstream from the headgate, a measuring device appurtenant to the headgate should be installed. The measuring device should be chosen from among the many weirs and flumes available to best fit the needs of the water user and the physical conditions of the site.

*Figure 12. Cipolletti sharp-crested weir.*

The most common type of weir is a sharp-crested weir. A particular type of sharp-crested weir called a Cipolletti weir is shown in Figure 12. Designs for the Cipolletti and other types of sharp-crested weirs are shown in Appendix H. Another option is to install a Ramp, Parshall, H, Palmer Bowlus, or Cutthroat or similar type of flume.

A properly-installed weir or flume will measure the rate at which water is being diverted. To measure the duty (annual amount of water used), a total flow meter or recorder would need to be installed in the weir pool or flume channel near the staff gage. The installation of the headgate and weir or flume is most important. The recorder may be installed in the future if needed to monitor or regulate the duty of a water right.

An automated headgate may be installed as an appurtenant feature to the overall headgate design. An automated headgate allows a constant, targeted flow of water in the delivery ditch, regardless of the flow in the stream channel from where the water is diverted. The system works by way of a Cipolletti weir, ramp flume, or similar flow measuring device that reads the rate of flow in the delivery ditch, then transmits the flow data back to the headgate. This flow data then triggers an automatic adjustment of the headgate so that the target rate of water is delivered to the ditch.

The flow data is transmitted via radio signals or a hardwire connection. Hardwire connections are effective for transmission distances of 500 feet or less. Beyond that distance, radio transmissions are necessary. In any case, the flow measuring device must be no more than 20 minutes away from the headgate (in water travel time) for the automated system to work effectively. This 20-minute maximum lag time generally equates to one-half to one mile in stream distance.

### *2.2.4 Fish Screens*

Diversions of surface flow can also divert fish from the river and into irrigation systems where they generally do not survive or cannot return to the river. The primary means of correcting this loss of fish from ditch diversions is to screen them from the flow near the upstream end of the diversion system and return them to the river. The primary means of correcting fish loss into pump diversions is to screen the flow entering the pump forebay pool or intake pipe, thus keeping the fish in the river.

Irrigation ditches, where they cross streams, can cause undesirable mixing of irrigation water with stream water. In addition, irrigation ditches can sometimes capture and divert the streams themselves. At some times and locations, the return of irrigation flow to the river may be concentrated enough to pose an attraction for adult and juvenile fish to move up-current into irrigated fields or irrigation ditches. Siphons can be used to send the irrigation water through a pipe under the stream. Screens can also be used to keep fish out of irrigation ditches, though they are less effective than siphons.

Several types of fish screens are available, including: rotary drum, flat plate, traveling belt, well screens, and Johnson screens. For each specific site, screens will be sized to accommodate the maximum legal flow rate, designed to protect the smallest fish present (per NMFS criteria), and located according to local topography to obtain the gradient needed for efficient operation of screens and return of fish to the river (Appendices C and D). Reclamation will coordinate with ODFW 's John Day Screen Shop to ensure that all fish screens meet applicable acceptable screen criteria.

NMFS has published detailed criteria for surface water and pump intake screens to protect salmonids of fry (less than 2.36 inches long) and fingerling (greater than 2.36 inches long) sizes (Appendices C and D). Because most of the project area is potential spawning and rearing habitat for salmonids (see Section 3.4.1), it is likely that protection for salmonid fry will be expected at most locations. USFWS considers NMFS fish screen criteria sufficient for the protection of bull trout (Chris Allen, USFWS, personal communication, September 2002). The screen descriptions in the following sections are generic.

2.2.4.1 *Rotary drum screens*

Rotary drum screens are the preferred technology for screening juvenile fish from most small (less than 30 cfs) surface water diversions in the John Day Basin because they have been proven efficient and self-cleaning. Typical single and dual drum screens are shown in Figures 13a and 13b.

*Figure 13a. Dual drum fish screen with trash rack.*

Generally, rotary drum screens will consist of a cylindrical screen, a drive mechanism (paddlewheel, solar, or electric power) to rotate the screen, a frame and seal, a headgated bypass system to return fish to the river, flashboards to adjust the water level on the screen, and a gantry for suspending the screen when not in service (see Appendices I and J for general design features). Where necessary, steel or concrete abutments, retaining walls, and trashracks will be incorporated into the design (Figures 13a and 13b illustrate these features).

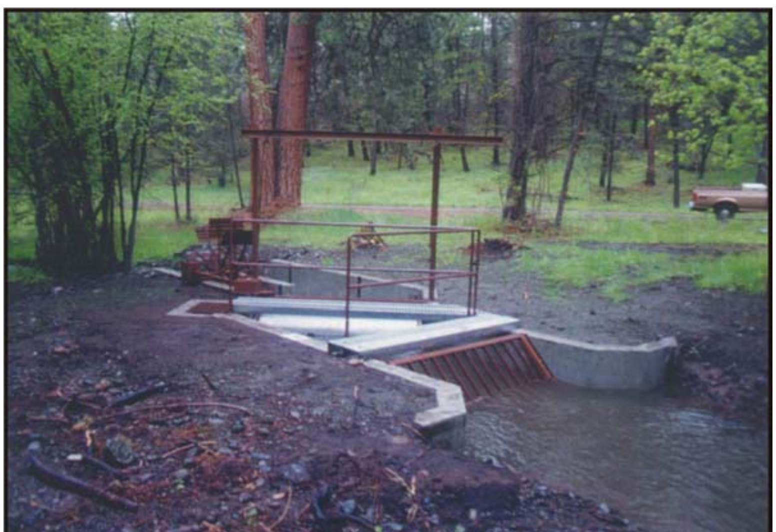

*Figure 13b. Single drum fish screen with trash rack.*

Rotary drum screens are typically installed in the diversion ditch, and can be built in dry conditions when ditches are shutdown. Generally, no in-stream construction is required. Construction sites have typically already been disturbed by construction of the ditch and/or the old fish screen.

*2.2.4.2 Flat plate and traveling belt screens*

At sites where rotary drum screens are not practical, these alternative screen types may be appropriate. Flat plate and traveling belt screens may be most appropriate where water levels vary drastically (e.g. a rotary drum screen might be submerged part of the time) and where debris loads are low (because they are less efficient at self-cleaning than rotary drum screens).

Flat plate screens are simply a plate of screen material placed vertically, horizontally, or at an angle in the diversion (Figure 13c). To meet NMFS criteria to be self-cleaning, they must include a cleaning system such as an array of electric, water paddle or solar-powered wipers. Although there is substantial variation in designs, a typical flat plate screen installation consists of a screen plate, a system of baffles to equalize flow through the plate, a concrete or steel supporting structure, a cleaning system, a fish bypass system for return to the river, and flashboards to control the water level on the screen (see Appendices K and L for general design features).

*Figure 13c. Flat plate fish screen.*

Traveling belt screens consist of a flexible belt-like screen (sometimes plastic) placed in the diversion (Figure 13d). The screen moves along a track so that the upstream side moves upward and the downstream side moves downward, thus helping to clean debris from the screen similar to a rotating drum screen. A typical installation includes a belt screen and track, a power system (hydraulic, electric, or solar), a supporting structure, a fish bypass system, and flashbords to control water level on the screen (see Appendices M and N for general design features).

*Figure 13d. Traveling belt fish screen.*

There are substantial variations possible with these screen types. For instance, if they are installed at the very entrance to the diversion adjacent to the river channel, the fish bypass system and flashboards may not be necessary.

Flat plate and traveling belt screens are typically installed in the diversion ditch, and can be built in dry conditions when ditches are shutdown. Generally, no in-stream construction is required. Construction sites have typically already been disturbed by construction of the ditch and/or the old fish screen.

#### *2.2.4.3 Screen pump intakes*

Pump intakes will be screened using exposed or buried well screens, or Johnson screens, sized and designed to meet NMFS criteria for the applicable fish sizes. Examples in the project area include the Cathedral Rocks, Kight, Ediger, and Page irrigation projects (USBR 2000).

Screening the intake of an existing pump would not require in-stream work, except to place the screened pipe into the river. Metal fabrication and installation would occur offsite and on the bank.

See Appendix C for NMFS detailed criteria for pump intake screens.

#### *2.2.4.4 Siphons*

Siphons (sometimes called inverted siphons or drop siphons) can be used to send irrigation water through a pipe under the stream. Siphons are closed conduits designed to run full and under pressure. The closed conduit pipe is often made of PVC material. See Appendix W for a generic siphon design.

The conduit pipe is designed to handle the maximum flow of the irrigation ditch. The siphon is installed in a trench that is excavated along the centerline of the irrigation ditch where it crosses the stream. Siphons are installed while the flow in the irrigation ditch is turned off. Soil is backfilled around the pipe and compacted. The pipe is protected by rip-rap armour rock placed on the backfill over the pipe. Inlet and outlet structures are made of concrete. Disturbed ground is reshaped to natural or near-natural conditions and revegetated following construction. This construction technique allows the stream to flow over the siphon along its natural course.

Streamflow during construction is diverted around the construction site so that virtually all work is completed in dry or semi-dry conditions. All in-stream work takes place during the ODFW in-stream work period.

Examples of siphons include the John Day irrigation flow siphoned under Laycock Creek and the John Day irrigation flow siphoned under Bear Creek. This last project was completed in the summer of 2002 by ODFW with technical support by Reclamation.

Alternatively, screens (as described in the sections above) can be used to prevent the movement of fish from streams into irrigation ditches. However, screens are most effective in this application when used at the "tail waters" of irrigation ditches; i.e., the end of the irrigation return flow ditch or pipe as it re-enters the stream. An example of the use of a rotary screen to screen an irrigation ditch is the John Day River irrigation flow prior to the ditch entering Riley Creek.

### 2.2.5 Mitigation

General program practices to minimize the negative impacts of the proposed action, and to mitigate for unavoidable negative impacts, include:

A. General
   1. Obtain all required federal, state and local permits.
   2. Design structures and conservation practices in accordance with Natural Resources Conservation Service technical guidelines and accepted engineering practices.
   3. Inspect each project site to determine the presence of threatened and endangered plant and animal species and conduct Section 7 consultations as required.
   4. Inspect each project site where there is the potential for historic properties or scientifically-important paleontological sites to exist. If they are present, seek to avoid adverse impacts to the resource site. If adverse impacts cannot be avoided, implement appropriate mitigations actions. Resource significance, project impacts, and mitigation treatment will be determined using processes defined in 36 CFR 800. (Note: The Code of Federal Regulations (CFR) is a codification of the general and permanent rules published in the *Federal Register* by the Executive departments and agencies of the federal government).
   5. When appropriate, consult with tribes to determine if Indian sacred sites are present. Seek to avoid damage to those that are identified.
   6. Provide landowner or other appropriate personnel with operation and maintenance procedures that will produce optimum conservation benefits over the life of the project.

B. Project design
   1. Design fish screens and bypass systems at ditches, pumps, and infiltration galleries to meet NMFS criteria (Appendices C and D).
   2. Design fishways to meet NMFS criteria (currently unpublished) for upstream passage of juvenile and adult salmonids.
   3. Apply the most recent NMFS protocols (currently NMFS 2001) to ensure that water acquisition projects provide streamflows and water depths which improve the protection of listed steelhead and salmon.
   4. Seek to design to avoid impacts to National Register-eligible historic properties, scientifically-important paleontological sites, or Indian sacred sites.

C. Construction timing and location
   1. Perform in-stream activities within the ODFW guidelines for timing of in-water work, and coordinate with the District Fish Biologist for emergency extensions of the work window, which is:
      - July 15 to August 15 in the Upper John Day (main stem) upstream from John Day, and the Middle Fork and North Fork John Day upstream from the Highway 395 crossings,

- July 15 to August 31 in the remainder of the reaches downstream from John Day and Highway 395, or
- An alternate work window that may be required by ODFW or NMFS.

2. Time construction to avoid conflicts with bald eagles and other protected wildlife of site-specific concern.
3. Install fish screens and siphons while diversions are shut down to avoid contact with flowing water during construction.
4. Avoid demolition of pushup dams while the adjacent pools are harboring adult chinook salmon or steelhead.
5. Locate infiltration galleries in habitats where salmon and steelhead are not likely to spawn.

D. Construction practices

1. Use appropriate construction methods to isolate in-channel construction areas from flowing water to minimize turbidity and sediment released from site.
2. Insure that petroleum products, chemicals or other harmful materials are not allowed to enter the water.
3. Perform as much machine work as possible from the streambanks to minimize disturbance to the streambed.
4. Minimize disturbance to riparian vegetation.
5. Restore the site to near-original conditions/grade. Remove spoils from the construction area when it is not possible to shape them to near-original conditions.
6. Dispose of construction spoils and waste materials at proper sites away from the stream channel.
7. Use silt screens to minimize the overland flow of fine sediments from construction sites into the stream during precipitation events.
8. Capture salmonids that are inadvertently trapped in sections of ditch or river isolated for construction, and liberate them into adjacent flowing water.
9. If National Register-eligible historic properties, scientifically-important paleontological sites, or Indian sacred sites are present near construction impact areas, implement protective strategies to avoid or minimize damage during construction.

E. Site recovery

1. Stabilize disturbed riparian and streambank soils with native grasses and vegetation, such as willows, red osier dogwood, and cottonwood.
2. Fence riparian areas where existing fences are disturbed by construction, or where fence is required to facilitate vegetation recovery after planting.
3. Vacate construction sites leaving a positive visual impact blending with the natural landscape.

These general mitigation measures, as well as those specific measures from Chapter 3, are included in Appendix O, Environmental Commitments.

Design and other criteria can be modified or augmented as part of consultation on individual, site-specific, in-stream projects. All actions related to the implementation of Action 149 will be conditional to the appropriate criteria developed during forthcoming programmatic and site-specific consultation with NMFS and USFWS.

### *2.2.6 Alternatives Considered but Eliminated from Further Study*

The actions shown in Table 5 below were considered, but not included in an alternative and were eliminated from further study because they do not fit in with the management constraints noted in Section 2.2.1 above. Some of these actions were identified during the scoping process. Other alternatives as described in Table 5 were developed during the course of preparing this PEA.

Table 5. Actions Considered but Eliminated from Further Study.

| Actions | Reasons for Elimination |
|---|---|
| Remove fish-barrier culverts | Not required by the BiOp |
| Manage for removal of thermal barriers | Not required by the BiOp |
| Thin juniper trees to reduce water consumption | Not required by the BiOp |
| Flood fields artificially during non-irrigation season to increase groundwater supply | Not required by the BiOp |
| Store water in-channel, e.g. behind beaver dams, for release to improve flows | Not water acquisition by purchase or lease, not required by the BiOp |
| Store water off-channel for release to improve flows | Not water acquisition by purchase or lease, not required by the BiOp |
| Supplement surface water quality and quantity via exchange with groundwater | Not required by the BiOp |
| Offset surface water usage with groundwater from wells not hydrologically connected to surface water | Not required by the BiOp |
| Supplement in-stream water quality and quantity via irrigation return flow projects | Not required by the BiOp |
| Align NMFS screen requirements with fish life stage distribution | Not required by the BiOp |
| Install streamflow gaging stations | Not Reclamation responsibility – responsibility of Oregon Water Resources Department |
| Convert to less water-intensive crops | Not required by the BiOp |
| Regulate rate and duty | Not required by the BiOp |
| Restore riparian areas and vegetation | Not required by the BiOp |
| Restore uplands | Not required by the BiOp |
| Remove roads | Not required by the BiOp |
| Restore flood plains by removing “channelizing” mine tailings | Not required by the BiOp |
| Reconstruct/modify low-flow channels | Not required by the BiOp |